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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/617,792	07/14/2003	Masayoshi Koike	F03-354-USdiv	4088
21254	7590	12/14/2005	EXAMINER	
MCGINN INTELLECTUAL PROPERTY LAW GROUP, PLLC 8321 OLD COURTHOUSE ROAD SUITE 200 VIENNA, VA 22182-3817			MULPURI, SAVITRI	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 12/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/617,792

Applicant(s)

KOIKE ET AL.

Examiner

Savitri Mulpuri

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 November 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 17-19, 21, 23-26 and 56, 57--65 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 17-19, 21, 23-26 and 57--65 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

This action is in response to the applicant's communication, RCE, filed on 11/23//2005.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 61-65 rejected under 35 U.S.C. 102(b) as being anticipated by Ng (from PTO-892)

With respect to claims 61-65, Ng teaches forming multi-quantum well (MQW) semiconductor materials for light emission (see page 584, lines 24-26). Ng specifically teaches n-i-p-i multi quantum well heterostructures, where heterostructure are adjacent layers with different composition (see fig. 9.1 (c) and (d). In Ng intrinsic layer is a undoped barrier layer and is sandwiched between p-layer and n-layer. NG teaches the n-i-p-i MQW structure has multiple purposes such as minimal electron-hole recombination, very long carrier life time, may orders of magnitude higher than regular material, and tunable effective energy gap from the intrinsic material enables light emission of longer wavelength (see page 584, lines 16-29). In Ng et al, barrier layer is inherently have band gap higher than the p-type and n-type quantum well layers, which is principle concept of quantum well structure. Conceptually, in quantum well structure barrier layer has to have larger band gap than the band gap of the quantum well layers.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 17-19, 21, 23-26, 56-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura et al (US5,777, 350) in combination with Ng (from PTO 892).

Nakamura et al teach a method of making light emitting devices by forming gallium nitride based multi quantum well structure. Nakamura teach MQW having well and barrier layer with different combinations of doped or non-doped well and doped or non-doped barrier layers. Nakamura particularly teach in MQW structures, well layers can be p- doped or n-doped materials, wherein Mg as p-dopant and Si as n-dopant.(see col. 15, lines 23-67). Nakamura teach barrier layer is non-doped in MQW (col. 43, lines 30-67 and col. 44, lines 1-35). Nakamura teaches Mg, Cd, Zn , Be as p-type dopants (see col.9, lines 10-15). Nakamura teaches the thickness and compositions of the well and barrier are similar to claimed thicknesses and compositions.

Nakamura teaches in example non-doped InGaN as a barrier layer, wherein indium(In) content is .05, whereas InGaN grown as well layer, wherein the indium content is 0.15. In InGaN layer as the indium content increases the band gap becomes lower, so well layer has lower band gap than the barrier layer, which meets the amended claimed limitations.

Nakamura et al do not teach undoped barrier layer sandwiched with p- well layer and n-well layer.

Ng teaches forming multi-quantum well (MQW) semiconductor materials for light emission (see page 584, lines 24-26). Ng specifically teaches n-i-p-i multi quantum well heterostructures, where heterostructure are adjacent layers with different composition (see fig. 9.1 (c) and (d)). In Ng intrinsic layer is a undoped barrier layer and is sandwiched between p-layer and n-layer. NG teaches the n-i-p-i MQW structure has multiple purposes such as minimal electron-hole recombination, very long carrier life time, may orders of magnitude higher than regular material, and tunable effective energy gap from the intrinsic material enables light emission of longer wavelength (see page 584, lines 16-29).

It would have been obvious to one of ordinary skill in the art to form n-i-p-i structure as MQW in the invention of Nakamura because such structure would give several benefits such as minimal electron-hole recombination, very long carrier life time, may orders of magnitude higher than regular material, and tunable effective energy gap from the intrinsic material enables light emission of longer wavelength as disclosed by Ng (see page 584, lines 16-29).

Applicant's arguments filed 11/23/2005 have been fully considered but they are not persuasive. Applicant's arguments with respect to claims 17-19, 21, 23-26, 56-65 have considered, which are not persuasive. After further review and analysis, the combination Nakamura and Ng teach forming GaN based p-i-n-i MQW structure, wherein intrinsic layer has undoped and has larger band gap than the well layers. See Nakamura teaches using barrier layer InGaN as either doped or non-doped, and Ng teaches strictly non-doped or intrinsic barrier layer. Nakamura teaches, in example 24, non-doped InGaN as a barrier layer, wherein indium(In) content is .05, whereas InGaN grown as well layer, wherein the indium content is 0.15. In InGaN layer as the indium content increases the band gap becomes lower, so well layer has lower band gap than the barrier layer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Savitri Mulpuri whose telephone number is 571-272-1677. The examiner can normally be reached on Mon-Fri from 8 a.m. to 4.30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt, can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

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published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Savitri Mulpuri  
Primary Examiner  
Art Unit 2812